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ATTACHMENT B

SCOPE OF WORK FOR SITE INVESTIGATION WORK PLAN
ADMINISTRATIVE ORDER ON CONSENT
U.S. EPA DOCKET NO.

Components of the Site Investigation Work Plan

A. Environmental Setting

The Site Investigation Work Plan shall include provisions to collect information to supplement and verify existing information on the environmental setting at the Site. Such characterization shall extend, at a minimum, as necessary to confirm that the full extent of each hazardous waste and/or hazardous constituent released at or from the Facility has been identified in order to ensure protection of human health and the environment. The Site Investigation Work Plan shall provide for characterization of the following:

1. Hydrogeology

The following shall be provided:

- a. A description of regional and site-specific geologic and hydrogeologic characteristics affecting groundwater flow and contaminant migration beneath the Facility. This description shall include, but not be limited to:
 - (1) Regional and site-specific stratigraphy. At a minimum, this shall include a detailed lithologic description of the Site from the surface to the base of the lower confining units or within the zone of contamination as specified by EPA. All soil borings shall be logged continuously or at specific intervals approved by EPA. Lithologic descriptions shall include, but not be limited to, items such as grain size and sorting, depositional environment, and description according to the Unified Soil Classification System.
 - (2) An identification of areas of groundwater recharge and discharge, their location and characteristics.
 - (3) An evaluation of the continuity of stratigraphic units within the Site.
- b. A description of each hydrogeologic unit which may serve as a contaminant migration pathway at or from the Facility. This description shall be based upon, at a minimum, field studies, soil and aquifer tests, and soil borings and samples. The description shall identify all distinct water bearing zones and/or systems and any intervening saturated or unsaturated units at the Site. The description shall include, but not be limited to, the following information:
 - (1) Hydrogeologic cross sections indicating the location and extent of each hydrogeologic unit;
 - (2) An identification of each geologic formation, group of formations, or part of a formation in all water bearing zones capable of yielding a significant amount of groundwater to wells or springs. This shall include all water bearing zones that may serve as a pathway for contaminant migration, including perched saturated

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zones;

- (3) Estimates of hydraulic conductivity and total porosity for each hydrogeologic unit as necessary to characterize the impact of each such unit on groundwater flow and potential contaminant transport;
- (4) An identification of zones of contrasting hydraulic conductivity that may affect the migration of contaminants as necessary to characterize groundwater flow and potential contaminant transport;

c. A description of the regional and site-specific hydrogeologic flow regime for each hydrogeologic unit identified pursuant to A.1.b of this Attachment. At a minimum, the groundwater hydrogeologic flow description shall include the following:

- (1) Water level contour and/or potentiometric surface maps using measurements from existing and newly installed wells. These maps shall meet the following requirements:
 - i) Contour maps shall incorporate representative data obtained from water level or fluid pressure measurements from all groundwater monitoring wells used to fulfill the requirements of this Order.
 - ii) Contour maps shall be prepared for the each water bearing zone identified.
 - iii) In the event that pressure transducers are used, contour maps shall reflect the influence of barometric pressure, if any, on water level measurements. Barometric pressure shall be recorded at the beginning and end of every period during which groundwater levels are measured to fulfill the requirements of this Order.
 - iv) Contour maps shall reflect the presence and influence of any non-aqueous phase liquids. Any measurements necessary to correct water levels for the presence of these liquids shall be taken at the time of water level measurements. Interphase probes must be utilized in measuring non-aqueous phase liquids.
- (2) Hydrogeologic cross sections showing the magnitude of vertical gradients constructed at scales approved by EPA;
- (3) Other graphical representations of the magnitude and influence of vertical and horizontal gradients on the contaminant transport at the Site.
- (4) The flow system, including the vertical and horizontal components of flow, as described through flow vectors or the construction of flow nets, as necessary to identify and characterize potential contaminant transport pathways;
- (5) Any changes in the hydraulic flow regime due to seasonal influences;
- (6) An identification and interpretation of any hydraulic interconnections within and between saturated zones at the Site and all downgradient areas potentially impacted by releases at or from the Facility, including quantification of recharge

to these aquifers;

- (7) Hydrographs depicting the variation of water levels in each well over the period of water level measurements.
 - (8) An evaluation and investigation of groundwater mounding at the Site which may affect contaminant transport pathways.
 - (9) An identification of the location and estimation of the amount of groundwater recharge and discharge.
- d. A description of human influences, including off-site structures and conditions, that may affect the hydrogeology of and migration of any contaminants at or from the Facility, identifying:
- (1) Active and inactive local water withdrawal wells with the potential to affect groundwater flow at the Site, and approximate pumping schedules; and,
 - (2) Structures including, but not limited to, gas and electric utilities, pipelines, french drains, ditches, unlined ponds, septic tanks, NPDES outfalls, sewer pipes, stormwater drains, and retention areas etc.
- e. A description of regional and site surface water flow regimes based on present and historical conditions since operations began on the Facility. At a minimum, this description must include:
- (1) Description and map of surface water channels(named or unnamed) to Portage and Quilceda Creeks as identified in published reports by the United States Geologic Survey (USGS) and Snohomish County,
 - (2) Recharge areas to groundwater

2. Soils

The Site Investigation Work Plan shall include characterization of the soil in the vicinity of known and suspected contaminant releases. Such characterization shall include all factors necessary and appropriate to define the potential for contaminant migration and to evaluate contaminant fate and transport in the soil system. Unless otherwise specified by EPA, examples of the descriptions and measurements which must be included in the characterization of the soil, include, but are not limited to, the following:

- a. Soil descriptions in accordance with the Unified Soil Classification system;
- b. Surface soil distribution;
- c. Hydraulic conductivity (saturated);
- d. Bulk density;
- e. Porosity;
- f. Cation exchange capacity (CEC);
- g. Soil organic matter content;
- h. Soil pH;
- i. Particle size distribution based on sieve analyses;
- j. Moisture content;
- k. Presence of stratification or soil structures that may affect unsaturated flow;

- l. Infiltration;
- m. Evapotranspiration;
- n. Storage capacity;
- o. Mineral content;
- p. Contaminant attenuation or absorption capacity and mechanisms;
- q. Color photographs of all samples intervals, with a size scale present in each photograph.

All soil borings conducted under the Site Investigation Work Plan shall be logged continuously, or at specific intervals approved by EPA. Respondent shall conduct sufficient soil borings to provide for a detailed lithologic description from the ground surface to, at a minimum, into the confining unit, as determined by EPA. The Site Investigation Work Plan shall include provisions to extend this characterization as necessary to determine the full extent of soil contamination. Soil characterization shall occur for each distinct soil type in all soil borings. All soil borings shall be abandoned using bentonite or bentonite grout, unless such boring is completed as a groundwater monitoring well under this Order.

B. Contamination Characterization

The Site Investigation Work Plan shall include requirements to collect analytical data on groundwater, soils, air, surface water, and sediment contamination at and from the Facility and other areas affected by Facility operations. This data shall be sufficient to define the origin, nature and extent, and direction and rate of contaminant migration. Data shall include time and location of sampling, environmental conditions during sampling, media sampled, contaminant concentrations, and the identity of the individuals performing the sampling and analysis. Analytical methods must be those specified in Test Methods For Evaluating Solid Waste-Physical/Chemical Methods, U.S. EPA Publication No. SW-846, Final Update III, promulgated on June 13, 1997, (See 62 FR 32452), Methods for Chemical Analysis of Water and Wastes, EPA Report 600/4-79-020, March 1983, or alternate methods approved by EPA and which Respondent has demonstrated will perform equal to or better than SW-846 methods under conditions expected in the investigation.

Respondent shall address the following types of contamination at or from the Facility:

- 1. Groundwater Contamination:
 - a. The Site Investigation Work Plan shall include requirements to characterize any groundwater contamination at or from the Facility. This investigation shall, at a minimum, provide the following information:
 - (i) A description of the horizontal and vertical extent of any immiscible or dissolved contaminants originating from the Site, including concentration profiles of all parameters identified in B.1.d.(1) of this Attachment and any potential degradation products of those parameters;
 - (ii) The rate of contaminant migration;
 - (iii) An evaluation of factors influencing the migration of contaminants; and,
 - (iv) A prediction of future contaminant migration, and a justification of any assumptions, calculations or models used to develop the prediction.

The Site Investigation Work Plan shall document the procedures to be used in making the above determinations (e.g., well design, well construction, the use of Push Probe

technology to aid in the placement of wells, iterative sampling concepts, geophysical investigative methods, groundwater modeling, etc.).

- b. The Site Investigation Work Plan shall include provisions for installation of all groundwater monitoring wells needed to delineate the nature and extent of any contamination at or from the Facility. These requirements shall define the criteria for placement of wells, and the design and installation procedures to be used. The Site Investigation Work Plan shall include provisions to extend the groundwater monitoring well system as necessary both horizontally and vertically to determine the full extent of groundwater contamination. The proposed groundwater monitoring system and monitoring well network shall meet the following requirements:
- (1) The network shall contain upgradient wells capable of yielding samples representative of background water quality in each hydrogeologic unit identified pursuant to A.1.b of this Attachment and that are not affected by releases of hazardous waste and/or hazardous constituents from the Facility. The number and location of the wells must be sufficient to characterize the spatial variability of background water quality.
 - (2) The network shall contain downgradient wells capable of detecting any release to groundwater in each hydrogeologic unit identified pursuant to A.1.b of this Attachment of hazardous waste and/or hazardous constituents from the Facility. The number and location of these wells must be sufficient to characterize the nature and extent of any such releases, including any such releases which have migrated off-site.
 - (3) The network shall be capable of operating for a period of time sufficient to provide representative groundwater samples during the investigation and the evaluation and implementation of any corrective measures required at the Site.
 - (4) Any existing wells at the Site included in the monitoring network that cannot meet the requirements of B.1.b.(1), (2) and (3) above, shall be decommissioned and supplemented by new monitoring wells if determined by EPA to be necessary.
 - (5) The Site Investigation Work Plan shall include provisions to evaluate results of sampling and analysis throughout the investigation, and to modify the groundwater monitoring network and the Sampling and Analysis and Data Management Plan (Attachment C) as necessary, based on this evaluation, to meet the objectives of the investigation.

Respondents shall follow the applicable guidelines and specifications in RCRA Groundwater Monitoring: Draft Technical Guidance (EPA/530-R-93-001, November, 1992), and the Technical Enforcement Guidance Document (EPA OSWER 9950.1, September 1986)(TEGD) and other available technical guidance approved for use by EPA.

- c. The Site Investigation Work Plan shall include provisions to provide the following information for all groundwater monitoring wells used to meet the investigation objectives in Attachment A:
- (1) A description and map showing all well locations, including each well's surveyed surface reference point and vertical reference point elevation. Wells shall be

surveyed using, or existing well elevations converted to, the National Geodetic Vertical Datum (NGVD), 1929, or updated to North American Vertical Datum of 1988 (NAVD88) to an accuracy of within 0.01. Horizontal surveying accuracy shall be within 1.0 foot and must include the Washington State Coordinate System of each location. The table which provides this data must reference the datum used for all measurements. Additional Regional guidance on constructing maps will be provided by EPA;

- (2) The boring and casing diameter and depth of each well;
 - (3) Specification of well intake design, including screen slot type, size and length, depth of screen, filter pack materials, and method of filter pack emplacement;
 - (4) Specification of the well casing and screen materials. Well construction materials shall be chosen based on parameters to be monitored, and the nature of contaminants that could potentially exist and migrate at or from the Facility. Well materials shall: (1) minimize the potential of adsorption of constituents from the samples, and (2) not be a source of sample contamination. Wells shall be constructed for the purpose of long term monitoring in accordance with all applicable federal, state, and local laws;
 - (5) Documentation of methods used to seal the well from the surface to prevent infiltration of water into the well and downward migration of contaminants through the well annulus;
 - (6) Description of well development methods and procedures;
 - (7) Documentation of all well design and installation parameters specified in Section 3.5 of the TEGD; and,
 - (8) Documentation that all boring, well installation, and well abandonment procedures comply with all applicable federal, state, and local laws, and were conducted by a licensed driller.
- d. The Site Investigation Work Plan's Sampling and Analysis and Data Management Plan (Attachement B) shall include the following elements specific to the groundwater monitoring network as necessary to meet the objectives of Attachment A.
- (1) Parameters for chemical analysis of groundwater samples. For the initial round of sampling, selected samples (including source areas and other less contaminated downgradient wells) shall be analyzed for all constituents specified in Appendix IX of 40 C.F.R. Part 264. The remainder of the samples in the initial round shall be analyzed for those constituents that might be present in the composition of wastes that are or have been managed at the Facility. Parameters for subsequent sampling events shall be selected, subject to EPA review and approval, based on the results of initial groundwater sampling and analysis, and upon the composition of wastes that are or have been managed at the Facility. The rationale for selection of all parameters shall be provided.
 - (2) A sampling schedule for groundwater monitoring. At a minimum, this schedule shall include collection of groundwater samples for chemical analysis from selected wells, as specified in the EPA-approved Sampling and Analysis and

Data Management Plan on a quarterly basis to characterize temporal trends and variations in groundwater contaminant concentration. The EPA-approved Sampling and Analysis and Data Management Plan shall specify wells to be sampled, sampling frequency, and a rationale for sampling.

- (3) Provisions for sampling and reporting of the occurrence, amount, thickness, and composition of any non-aqueous phase liquids encountered in any monitoring wells.

2. Soil Contamination:

- a. The Site Investigation Work Plan shall include requirements to characterize the contamination of the soil at the Facility and from the Facility and any contaminant releases. The Site Investigation Work Plan shall include provisions to extend this characterization as necessary both vertically and horizontally to determine the full extent of soil contamination. Soil sampling shall occur at the following locations, and where necessary to meet the investigation objectives:
 - (1) From all soil borings, from the surface as necessary to determine the full extent of contamination, at a maximum of 2.5 foot intervals, or at other intervals specified by EPA. Where EPA determines that contamination has impacted the aquifer and/or the lower confining units, or existing data or field observations so indicate, soil borings and sampling shall be extended vertically as necessary to determine the full extent of contamination;
 - (2) At all stratigraphic unit contacts;
 - (3) At the location of any preferred routes of contaminant migration;
 - (4) Where field observation or testing indicate greater concentration of contaminants relative to the nearest strata that would otherwise be sampled.
- b. The Site Investigation Work Plan Sampling and Analysis Plan shall document the following for soil sampling:
 - (1) The sampling techniques and equipment to be used;
 - (2) The parameters for chemical analysis. Selected samples shall be analyzed for constituents specified in Appendix VIII of 40 C.F.R. Part 261, with a potential to be present based on the composition of wastes that are or have been managed at the Facility. Parameters for subsequent sampling events shall be selected, subject to EPA review and approval, based on the results of initial sampling and analysis, and upon the composition of wastes that are or have been managed at the Site. The rationale for selection of all parameters shall be provided.
- c. The Site Investigation Work Plan shall provide for documentation of the following information, including any associated calculations, derivations or assumptions:
 - (1) A description of the vertical and horizontal extent of contamination for all 40 C.F.R. Part 261, Appendix VIII contaminants detected in soil at the Site.
 - (2) A description of contaminant properties and contaminant/soil interactions within

the contaminant source area and plume. Examples of properties and interactions which may be required include contaminant solubility, speciation, adsorption, leachability, retardation coefficients, biodegradability, hydrolysis, photolysis, oxidation, soil cation exchange capacity, and other factors that might affect contaminant migration and transformation. This information shall be presented in sufficient detail to fulfill the objectives of the investigation.

- (3) Concentrations of each contaminant in all soil samples.
- (4) The rate and direction of contaminant migration and a prediction of future contaminant migration rate, including consideration of releases of contamination from soils to groundwater.

3. Air Releases:

The Site Investigation Work Plan shall include requirements for characterizing or controlling air releases of hazardous constituents at or from the Facility.

- a. For each air release at the Site, the Site Investigation Work Plan shall include a description of the unit and/or process, and control devices if present. The description should clearly identify whether the unit and/or process is subject to regulation by the Puget Sound Air Pollution Control Authority and/or 40 C.F.R. Part 264 Subparts AA and/or BB, and must describe the emission limits under those programs. The Site Investigation Work Plan shall include specific provisions to determine the following:
 - (1) The composition and concentration of hazardous constituents present in the air over the units and at any additional locations identified in the Site Investigation Work Plan;
 - (2) The estimated rates of release of hazardous constituents from the units and the bases for determining the estimates, such as observed concentrations of constituents at the units, physical and chemical characteristics of waste constituents, meteorological data, and any theoretical assumptions, analytical techniques or models used to arrive at the estimates; and,
 - (3) The predicted exposures and risks of harmful effects to receptors of air emissions of hazardous constituents from the specified units. All calculations, algorithms, existing and new information, and all assumptions used to estimate the effects of air emissions, shall be documented in the findings.
- b. If direct measurements of air releases from the Facility are to be used to fulfill the requirements of this Order, then the Site Investigation Work Plan's Sampling and Analysis and Data Management Plan shall document the following elements specific to characterization of releases to air at or from the Facility:
 - (1) The type, number and location of air sampling stations proposed for the investigation;
 - (2) The sampling methods and frequency of sampling to be used; and,
 - (3) The parameters for analysis and analytical methods to be used. Air samples shall be analyzed for all major volatile organics in wastes accepted at the Site.

4. Surface Water Contamination:

The Site Investigation Work Plan shall include requirements to determine the nature and extent of surface water and sediment contamination due to discharges of contaminated groundwater at or from the Facility. The Work Plan shall specify the methods and procedures to be used to characterize the following:

- a. Site surface and groundwater flow paths and an evaluation of the potential for surface and groundwater flows to discharge to existing surface water drainage. This evaluation shall consider current and historical conditions and operations, proximity of the site to off-site surface water, proximity and elevation of groundwater to off-site surface water, the proximity of potential surface and groundwater receptors to the site groundwater contamination and other appropriate information. The Work Plan shall identify areas that have a potential to be groundwater or surface water discharge points to surface water and shall include a rationale for selection of areas of potential concern.
- b. The contribution of contaminated groundwater discharges and contaminated stormwater and/or run-off to surface water at and downgradient from the Facility, including discharges of contaminated groundwater to surface drainage ways and surface waters, and discharges of groundwater to subsurface drainage facilities for stormwater management at or from the Facility.
- c. The nature and extent of surface water and sediment contamination due to contributions of hazardous waste and/or hazardous constituents from the Site, including those sources identified above.
- d. The Site Investigation Work Plan shall include specifications for the following aspects of the surface water contamination investigation:
 - (1) The methods and equipment used to collect surface water and sediment samples for analysis.
 - (2) The locations for surface water and sediment sampling, and the rationale for their selection (e.g., groundwater discharge areas identified through flow net construction performed for the hydrogeologic characterization of the Site and potentially affected downgradient areas). At a minimum, sediment samples shall be taken at any on-site or off-site discharges, outfalls, outlets, catch basins or manholes associated with surface water flow from the Facility.
 - (3) Surface water and sediment samples from the initial round of sampling collected pursuant to this Order shall be analyzed for metals, total petroleum hydrocarbons, total solids, and those Appendix IX volatile and semivolatile organic compounds which are or have been present at the Site. Parameters for subsequent sampling events, if determined to be necessary by EPA, shall be selected, subject to EPA review and approval, based on the results of initial surface water and sediment sampling and analysis, and upon the composition of wastes that are or have been managed at the Facility. The rationale for selection of all parameters shall be provided.

C. Reporting

Concurrent with the Site Investigation Work Plan, Respondent shall submit a comprehensive stand alone data document that contains: 1) a facility map that includes all the sampling, boring and well locations; 2) all results for constituents monitored in each medium (soil, groundwater, surface water, etc.); 3) all groundwater elevation data; and, 4) all well and boring logs. This stand alone data document shall be updated to include the location of each new sampling, boring and well, and the results of all validated data, groundwater elevation data and well and boring logs as such data become available. This updated comprehensive stand alone data document shall be submitted to EPA annually until the termination of this Order, beginning one year from the date of the initial submission of the comprehensive stand alone data document. The information required in the initial and each subsequent comprehensive stand alone data document shall be in the form of charts, graphs, maps, diagrams or tables, as determined by EPA. In addition, concurrent with the submission of each periodic progress report, Respondent shall submit a stand alone data document addendum that includes any new: 1) sampling, boring and well locations; 2) results for constituents monitored in each medium; 3) groundwater elevation data; and, 4) well and boring logs that become available during the period of time covered by the progress report. Each stand alone data document addendum shall be submitted in the same format as the original comprehensive stand alone data document, unless determined otherwise by EPA. EPA may require approval of any of the stand alone data documents and exercise the process set forth in Section XII (EPA Approval of Plans and Other Submissions) of the Order in the event that EPA determines that such action is necessary.

The Site Investigation Work Plan shall specify the outline and format for the Site Investigation Report to present the findings of the investigation. The Site Investigation Work Plan shall specify groundwater data reporting procedures which are consistent with EPA Region X Groundwater Data Management System. These specifications shall include, but are not limited to, the following:

1. Construction of contour maps of groundwater concentrations for parameters selected based on the results of the initial round of sampling, or subsequent sampling, and subject to EPA review and approval. Contoured parameters will include the most abundant and representative constituents from each contaminant group including volatile organic, semi-volatile organic, metals, and pesticides and dioxins/furans, if detected. Additional constituents may be selected for contouring due to their high mobility or high toxicity. All contour maps shall be presented at a scale of one inch equals 50 feet or other such scale approved by EPA, and shall show the Site and cultural features sufficient for clear representation of the plume, and all affected down-gradient areas. All wells in the sampling program shall be accurately located on the map, and the concentrations of each constituent shall be clearly visible. Data manipulation, such as kriging, is not to be employed. Contour intervals shall be selected to clearly indicate changes in concentration within the plume, and are subject to EPA review and approval.
2. Construction of flow nets, maps and cross sections showing surface discharges of groundwater that flows beneath the Site, delineating the extent of discharge of contaminated groundwater, and showing areas of groundwater discharge that may become contaminated due to continued migration of contaminants in the subsurface;
3. Maps and cross sections depicting the estimated migration rates for contaminants in groundwater, considering advection, dispersion, adsorption, and degradation processes. The migration evaluations shall be prepared for two species from each of the following classes of compounds that are identified as originating at or migrating from the Site: volatile organic compounds, base neutral and acid extractable organic compounds, metals and cyanide compounds. In general, the species selected shall be the most mobile contaminants from each class that have been, or are likely to be, released at or from the Facility.

The Site Investigation Report shall describe all input data algorithms, estimates, assumptions, boundary conditions, sensitivity analyses, and model calibration procedures used to derive these predictions of groundwater contaminant migration;

4. The nature and extent of surface water and sediment contamination due to releases at or from the Facility, including maps depicting the concentration distribution over the sample locations illustrated at a scale of one inch equals 50 feet, or other such scale as approved by EPA; and
5. An assessment of the fate and transport of contamination in surface water and sediment, including maps depicting the maximum extent of exposure of aquatic organisms to contaminant concentrations at levels that may have adverse impacts, to the extent these impacts can be distinguished from those due to ambient surface water and sediment quality in the area.
6. The Site Investigation Report must contain tabular displays that present the results for constituents monitored in each medium (soil, groundwater, surface water, etc.) for both historic monitoring events and for monitoring events undertaken during the implementation of the Site Investigation Work Plan.